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IMPLEMENTATION PLAN REVIEW FOR HAWAII AS REQUIRED BY THE ENERGY SUPPLY AND ENVIROMENTAL COORDINATION ACT.

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16. ABSTRACT

Section IV of the Energy Supply and Environmental Coordination Act of 1974, (ESECA) requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interferring with the attainment and maintenance of the national ambient air quality standards. This document, which is also required by Section IV of ESECA, is EPA's report to the State indicating where regulations might be revised.

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IMPLEMENTATION PLAN REVIEW
FOR
HAWAII
REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

PREPARED BY THE FOLLOWING TASK FORCE:

U. S. Environmental Protection Agency, Region IX
100 California Street
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Environmental Services of TRW, Inc.
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U. S. Environmental Protection Agency
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

December 1974

HAWAII

ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT
(SECTION IV - STATE IMPLEMENTATION PLAN REVIEW)

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1.0 EXECUTIVE SUMMARY

The enclosed report is the U. S. Environmental Protection Agency's (EPA) response to Section IV of the Energy Supply and Environmental Coordination Act of 1974 (ESECA). Section IV requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). In addition to requiring that EPA report to the State on whether control regulations might be revised, ESECA provides that EPA must approve or disapprove any revised regulations relating to fuel burning stationary sources within three months after they are submitted to EPA by the States. The States may, as in the Clean Air Act of 1970, initiate State Implementation Plan revisions; ESECA does not, however, require States to change any existing plan.

Congress has intended that this report provide the State with information on excessively restrictive control regulations. The intent of ESECA is that SIP's, wherever possible, be revised in the interest of conserving low sulfur fuels or converting sources which burn oil or natural gas to coal. EPA's objective in carrying out the SIP reviews, therefore, has been to try to establish if emissions from combustion sources may be increased. Where an indication can be found that emissions from certain fuel burning sources can be increased and still attain and maintain NAAQS, it may be plausible that fuel resource allocations can be altered for "clean fuel savings" in a manner consistent with both environmental and national energy needs.

In many respects, the ESECA SIP reviews parallel EPA's policy on clean fuels. The Clean Fuels Policy has consisted of reviewing implementation plans with regards to saving low sulfur fuels and, where the primary sulfur dioxide air quality standards were not exceeded, to encourage States to either defer compliance regulations or to revise the SO_2 emission regulations. The states have also been asked to discourage large scale shifts from coal to oil where this could be done without jeopardizing the attainment and maintenance of the NAAQS.

To date, EPA's fuels policy has addressed only those States with the largest clean fuels saving potential. Several of these States have or are currently in the process of revising SO_2 regulations. These States are generally in the Eastern half of the United States. ESECA, however, extends the analysis of potentially over-restrictive regulations to all 55 States and territories. In addition, the current reviews address the attainment and maintenance of all the National Ambient Air Quality Standards.

There are, in general, three predominant reasons for the existence of overly restrictive emission limitations within the State Implementation Plans. These are:1) The use of the example region approach in developing State-wide air quality control strategies; 2) the existence of State Air Quality Standards which are more stringent than NAAQS; and 3) the "hot spots" in only part of an Air Quality Control Region (AQCR) which have been used as the basis for controlling the entire region. Since each of these situations affect many State plans and in some instances conflict with current national energy concerns, a review of the State Implementation Plans is a logical follow-up to EPA's initial appraisal of the SIP's conducted in 1972. At that time SIP's were approved by EPA if they demonstrated the attainment of NAAQS or more stringent state air quality standards. Also, at that time an acceptable method for formulating control strategies was the use of an example region for demonstrating the attainment of the standards.

The example region concept permitted a State to identify the most polluted air quality control region (AQCR) and adopt control regulations which would be adequate to attain the NAAQS in that region. In using an example region, it was assumed that NAAQS would be attained in the other AQCR's of the State if the control regulations were applied to similar sources. The problem with the use of an example region is that it can result in excessive controls, especially in the utilization of clean fuels, for areas of the State where sources would not otherwise contribute to NAAQS violations. For instance, a control strategy based on a particular region or source can result in a regulation requiring 1 percent sulfur oil to be burned state-wide where the use of 3 percent sulfur coal would be adequate to attain NAAQS in some locations.

EPA anticipates that a number of States will use the review findings to assist them in making the decision whether or not to revise portions of their State Implementation Plans. However, it is most important for those States which desire to submit a revised plan to recognize the review's limitations. The findings of this report are by no means conclusive and are neither intended nor adequate to be the sole basis for SIP revisions; they do, however, represent EPA's best judgment and effort in complying with the ESECA requirements. The time and resources which EPA has had to prepare the reports has not permitted the consideration of growth, economics, and control strategy tradeoffs. Also, there has been only limited dispersion modeling data available by which to address individual point source emissions. Where the modeling data for specific sources were found, however, they were used in the analysis.

The data upon which the reports' findings are based is the most currently available to the Federal Government. However, EPA believes that the States possess the best information for developing revised plans. The States have the most up-to-date air quality and emissions data, a better feel for growth, and the fullest understanding for the complex problems facing them in the attainment and maintenance of air quality standards. Therefore, those States desiring to revise a plan are encouraged to verify and, in many instances, expand the modeling and monitoring data supporting EPA's findings. In developing a suitable plan, it is suggested that States select control strategies which place emissions for fuel combustion sources into perspective with all sources of emissions such as smelters or other industrial processes. States are encouraged to consider the overall impact which the potential relaxation of overly restricitive emissions regulations for combustion sources might have on their future control programs. This may include air quality maintenance, prevention of significant deterioration, increased TSP, NO_x, and HC emissions which occur in fuel switching, and other potential air pollution problems such as sulfates .

Although the enclosed analysis has attempted to address the attainment of all the NAAQS, most of the review has focused on total suspended particulate matter (TSP) and sulfur dioxide (SO_2) emissions. This is because stationary fuel combustion sources constitute the greatest source of SO_2 emissions and are a major source of TSP emissions.

Part of each State's review was organized to provide an analysis of the SO_2 and TSP emission tolerances within each of the various AQCR's. The regional emission tolerance estimate is, in many cases, EPA's only measure of the "over-cleaning" accomplished by a SIP. The tolerance assessments have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for changing emission limitation regulations. In conjunction with the regional analysis, a summary of the State's fuel combustion sources (power plants, and industrial sources) has been carried out in Appendix C and D.

The findings of this report are as follows:

- The State of Hawaii has been reviewed for the most frequent causes of over-restrictive emission limiting regulations. Even though the State ambient air quality standards are more strict than the NAAQS, there is no indication that current TSP and SO_2 regulations are overly restrictive within the context of Section IV of ESECA.

- Although air quality data collected by EPA and the State of Hawaii show no SO_2 violations of the NAAQS, monitoring results by the Hawaiian Electric Company indicate one case where SO_2 air quality is exceeding the NAAQS. However, any contemplated revisions of emission limiting regulations should consider sources on an individual basis, as SO_2 is more a local than regional problem in the State.

- Particulate matter is a problem in the State of Hawaii, as there are reported violations of the NAAQS. Emissions result from bagasse combustion boilers and agricultural burning. Wind blown fugituve dust may also be a major source and EPA is currently collecting this data, as the SIP did not include fugitive dust in its inventory. Any increase in particulate emissions can only aggravate existing conditions. There is currently little possibility, therefore, of revising stationary source fuel combustion emission regulations.

- The State new source review system permits existing sources to switch to a higher sulfur fuel without going through the review procedure. Such switching may or may not result in air quality violations.

2.0 STATE IMPLEMENTATION PLAN REVIEW

2.1 SUMMARY

A revision of fuel combustion source emissions regulations will depend on many factors. For example:

- Does the State have air quality standards which are more stringent than NAAQS?
- Does the State have emission limitation regulations for control of:(1) power plants, (2) industrial sources, (3) area sources?
- Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?
- Has the State not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?
- Are there no proposed Air Quality Maintenace Areas?
- Are there indications of a sufficient number of monitoring sites within a region?
- Is there an expected 1975 attainment date for NAAQS?
- Based on reported (1973) air quality data, does air quality meet NAAQS?
- Based on reported (1973) air quality data, are there indications of a tolerance for increasing emissions?
- Are the total emissions from stationary fuel combustion sources proportionally lower than those of all other sources?
- Is there a significant clean fuels savings potential in the region?
- Must emission regulations be revised to accomplish significant fuel switching?
- Do modeling results for specific fuel combustion sources show a potential for a regulation revision?

The following portion of this report is directed at answering these questions. An AQCR's potential for revising regulations increases when there are affirmative responses to the above.

The initial part of the SIP review report, Section 2 and Appendix A, was organized to provide the background and current situation information for the State Implementation Plan. Section 3 and the remaining Appendices provide an AQCR analysis which helps establish the overall potential for revising regulations. Emission tolerance estimates have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for revising emission limiting regulations. In conjunction with the regional analysis, a characterization of the State's fuel combustion sources (power plants and industrial sources) has been carried out in Appendix C and D.

Based on an overall evaluation of EPA's current information, AQCR's have been classified as good, marginal, or poor candidates for regulation revisions. The following table summarizes the State Implementation Plan Review. The remaining portion of the report supports this summary with explanations.

2.2 AIR QUALITY SETTING - STATE OF HAWAII

The entire State of Hawaii is contained within one Air Quality Control Region (#060, see Figure A-1). At present, the city and county of Honolulu has been proposed as an Air Quality Maintenance Area for total suspended particulates, but EPA may possibly drop this proposal in the near future. The priority classifications for the AQCR are shown in Table A-1.

Table A-4 illustrates the Federal and State Ambient Air Quality Standards for SO_2, TSP and NO_x. As can be seen, the state standards are in all cases more stringent than the corresponding federal standards. The attainment data for meeting the federal primary and secondary TSP standard is July 1975. Since SO_2 air quality at the time of the SIP submittal was below the national secondary standard, no attainment data was required.

From the most currently available air quality data collected by EPA and state agencies (1973), it is apparent that TSP remains a problem (Table A-5), while SO_2 concentrations have stayed well below NAAQS. Sources of particulate emissions include the combustion of bagasse as a fuel and agriculatural burning, while power plants contribute the majority of SO_2 emissions.

STATE IMPLEMENTATION PLAN REVIEW
(SUMMARY)

"INDICATORS"	STATE TSP	STATE SO_2
• Does the State have air quality standards which are more stringent than NAAQS?	Yes	Yes
• Does the State have emission limiting regulations for control of:		
1. Power plants	No	Yes
2. Industrial sources	Yes	Yes
3. Area sources	Yes	Yes
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?	No	No
• Has the State not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?	Yes	Yes
• Are there no proposed Air Quality Maintenance Areas?	No[1]	Yes
• Are there indications of a sufficient number of monitoring sites within a region?	Yes	Yes
• Is there an expected 1975 attainment date for NAAQS?	Yes	2
• Based on reported (1973) Air Quality Data, does air quality meet NAAQS?	No	Yes[3]
• Based on reported (1973) Air Quality Data, are there indications of a tolerance for increasing emissions?	No	Yes[3]
• Are the total emissions from stationary fuel combustion sources lower than those of other sources?	Yes	No
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?	N/A	N/A
• Must emission regulations be revised to accomplish significant fuel switching?	N/A	N/A
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?	Poor	Marginal
• Is there a significant Clean Fuels Saving potential in the region?	N/A	N/A

N/A = not available
1 = this proposal may possibly be dropped in the near future.
2 = ambient air quality was below the NAAQS when the SIP was written.
3 = based on data collected by EPA and state air pollution agencies.
4 = Hawaii used an "example island" approach.

2.3 BACKGROUND ON THE DEVELOPMENT OF HAWAII's CONTROL STRATEGY

The Hawaii SIP is rather unique in that the control strategy employs an "example island" approach, with Oahu being the selected island. This approach is supported by the fact that 82% of the State's population resides on, and over half of the State's emissions of TSP, SO_2 and NO_x emanate from that island. The achievement of desired air quality levels was evaluated by proportional reduction calculations.

Two sets of control strategies are actually presented in the SIP - one for attaining the State ambient air quality standards and one for attaining national standards. The Governor requested that EPA consider only the control strategies to attain national standards and those other portions of the SIP necessary to comply with EPA requirements.

2.3.1 Particulate Matter Control Strategy

The control strategy to meet national primary and secondary standards is comprised of the following measures:

(1) Process weight table.

(2) Bagasse burning boiler limitation of 0.4 lbs/100 lbs of bagasse as burned.

(3) Incineration limitation of 0.2 lbs/100 lbs of refuse as charged.

(4) Open burning ban, except for backyard (which is banned on Oahu).

(5) Agricultural burning controlled through a permit system.

EPA anticipates the reevaluation of this strategy through the use of diffusion modeling because of some doubt as to the applicability of the "rollback" method of relating emissions to resulting air quality on an island-wide basis.

2.3.2 Sulfur Oxides Control Strategy

At the time of submission of the original SIP, it appeared that all SO_2 standards were being met and therefore, no control strategy was required to attain the national standards. To maintain the standards, the State adopted a new source review system. This strategy was approved by EPA. The definition of "new sources" in these regulations does not include modification at existing

facilities such as fuel switching. Therefore, existing sources can switch to higher sulfur content fuel, which may or may not cause air quality violations, without going through this review procedure.

Although not part of the SIP, the State also has a fuel sulfur content regulation, comprising of a limitation of 0.5% for units larger than 250 million Btu/hour heat input and a maximum of 2.0% sulfur for units less than 250 million Btu/hour heat input.

2.4 SPECIAL CONSIDERATIONS - HAWAII

There appears to be two problem areas in the SIP control strategies. The technique used to quantify the effects of the particulate strategy on ambient concentrations is limited and possibly not suited for use in Hawaii. This is because the islands are not single airsheds with uniform mixing. Also, the SIP did not include fugituve dust in the emission inventory. EPA is presently funding the collection of this data.

Although air quality data collected by EPA and the State indicate no SO_2 violations of the NAAQS, a monitoring study conducted by the Hawaiian Electric Company in May, 1973 show 24 hour SO_2 concentrations of 418 $\mu g/m^3$ and 207 $\mu g/m^3$ in the vicinity of the Kahe Power Plant on Oahu.

3.0 AQCR ASSESSMENTS

3.1 REGIONAL AIR QUALITY ASSESSMENTS

Any assessments of TSP air quality for the State of Hawaii should be done on an individual island basis, rather than considering the AQCR as a whole. This is because particulate matter is an areawide problem on each island and the emissions and air quality on any given island have very little influence on the emissions and air quality of another. SO_2 air quality should be evaluated on an individual source basis, as it is a localized problem. However, insufficient TSP and SO_2 air quality data on such a fine scale precluded these approaches. As a result the analysis presented in this report is done on an AQCR basis.

Tables B-1 and B-2 summarize the data which provide a number of indications for deciding whether or not emission limiting regulation revisions can be made. A word of caution must be mentioned concerning the particulate regulations. Even though the analysis indicates that the regulations need not be revised, it must be remembered that fugitive dust emissions were not accounted for in the SIP and no fugitive dust control strategy was devised.

3.2 POWER PLANT ANALYSIS

There are presently eight power plants in the State of Hawaii, all of which are oil fired and do not have the capability of burning coal without extensive modification. Consequently, no analysis was made in regard to switching to coal as a fuel, only on the effects of utilizing oil with characteristics different from what is presently being burned.

Because there are no regulations governing the emission of particulate matter from power plants, no analysis was carried out for particulates. The only regulation regarding SO_2 emissions is a fuel sulfur content limitation. Although this rule was promulgated to assure maintenance of the state SO_2 air quality standards, the analysis for the maintenance of the national secondary standard was made with this regulation as a guideline. Since the state SO_2 air quality standard is stricter than the corresponding national standard, adherance to the fuel sulfur content rule should assure that national standards will not be exceeded.

Table C-1 illustrates the results of the analysis. As can be seen, there would be a net reduction in SO_2 emissions if the power plants were to use the maximum permissible sulfur content oil under state regulation.

3.3 AREA SOURCE ASSESSMENT

The State of Hawaii was found to have no area sources which could be evaluated within the context of Section 4 of ESECA.

3.4 INDUSTRIAL/COMMERCIAL/INSTITUTIONAL SOURCE ASSESSMENT

This category of point sources in the State of Hawaii are rather unique in that a large number of these sources utilize bagasse as a fuel. However, this is not surprising, considering that agriculture is an extremely important industry in the State. No analysis was done for those sources burning bagasse, since no fuel savings can be realized by switching to a fossil fuel. For sources using residual oil (the only other type of fuel burned), no evaluation of the consequences of changing to a different sulfur content oil on particulate emissions was carried out, since particulate emissions from residual oil combustion comprises less than 3% of the total fuel combustion particulate emissions (the remainder is from burning bagasse). As was the case with power plants, the State fuel sulfur content regulation is used to assess the effects of fuel switching.

Table D-1 presents the changes in emissions which would occur if 95% of the major point industrial, commercial and institutional sources were in compliance. The net result is a reduction in SO_2 emissions.

3.5 FUEL ASSESSMENTS

3.5.1 Energy Supply Potential

The State of Hawaii has no indigeneous supplies of fossil fuel. There is the possibility of potential supplies of geothermal power.

APPENDIX A - STATE IMPLEMENTATION PLAN BACKGROUND

- State implementation plan information
- Current air quality information
- Current emissions information

Tables in this appendix summarize original and modified state implementation plan information, including original priority classifications, attainment dates, ambient air quality standards, and fuel combustion emission regulations. SAROAD data for SO_2 and TSP monitoring stations are shown for AQCRs in the state. NEDS emissions data by AQCR[1] are tabulated and broken down into fuel burning categories.

Tables A-10a and A-10b show a comparison of emission inventories in the original SIP and those from the NEDS. An emission tolerance, or emission tonnage which might be allowed in the AQCR and still not violate national secondary ambient air quality standards, is shown for SO_2 and particulates. Tolerance was based on either the degree of control expected by the SIP or upon air quality/emission relationships which are calculated from more recent data. In the former case, a tolerance is calculated from:

(allowable emissions (as calculated in the SIP) to meet national secondary standards) - (SIP predicted emissions at the attainment date)

In the latter case, a tolerance is calculated from:

(Allowable emissions (as calculated from current air quality data) to meet national standards) - (current emissions (as obtained from NEDS))

The value of the emission tolerance provides an indication of the degree of potential an AQCR possesses for fuel revisions and regulation relaxation.

Methodology for Increased Emissions Tolerance

A tolerance for increased emissions was determined as follows. First, an "allowable emissions" was calculated for each AQCR based on the current NEDS data and the percent reduction (or increase) required to meet the national secondary ambient air quality standards in that AQCR (worst case from Tables A-5 and A-6). This "allowable" was then compared to that from the SIP. If reasonable agreement occurred, then the "estimated emissions" which would result after implementation of the SIP in that AQCR was used to calculate an emissions tolerance. Thus, some credit could be given to an AQCR which might be restricting emissions more than required by ambient air quality standards. For instance, emission controls applied to AQCRs other than the example region

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[1] "1972 National Emissions Report, " EPA - 450/2-74-012, June 1974.

for the state may reduce emissions well below "allowables." In the event that no data existed or was available from the SIP for an AQCR, the current air quality was used to assign emissions tolerance based on proportional rollback or rollup. Current air quality was also the criteria, if emissions data from SIP and NEDS did not appear to be comparable (this is often the case).

When no SIP emissions data was available, and current air quality levels were less than one half of the level represented by an ambient air quality standard, no "rollup" emissions tolerance was calculated in Tables A-10 and A-11. This arbitrary cutoff point was chosen so as not to distort the emissions tolerance for an area. At low levels of a pollutant, the relationship between emissions and air quality is probably not linear.[1] Although this cutoff may leave some AQCRs with no quantifiable emissions tolerance, it was felt that no number at all would be preferable to a bad or misleading number.

It is emphasized that emissions tolerance is a region-wide calculation. This tolerance obviously makes more sense in, say, an urban AQCR with many closely spaced emissions sources than in a largely rural AQCR with geographically dispursed emissions.

[1] Low concentrations of pollutants probably indicate a low density of sources and that the air quality monitors are not located near the sources. Thus changes in emissions from the sources will not result in a linear change in air quality readings.

Table A-1 Hawaii Air Pollution Control Areas

Air Quality Control Region	Federal Number	Priority Classification[a]			Proposed AQMA Designations[b]	
		Particulates	SO_2	NO_x	TSP Counties[c]	SO_x Counties
Hawaii	060	II	III	III	(1) Honolulu	(0)

[a]Criteria based on maximum measured (or estimated) pollution concentration (in $\mu g/m^3$) in area.

Priority	I	II	III
	Greater than	From-to	Less than
Sulfur Oxides			
Annual arithemetic mean	100	60-100	60
24 hour maximum	455	260-455	260
Particulate Matter			
Annual geometric mean	95	60-95	60
24 hour maximum	325	150-325	150
Nitrogen Dioxide	110		110

[b]Federal Register, August 1974, SMSA's showing potential for NAAQS violations due to growth.

[c]This proposal may possibly be dropped.

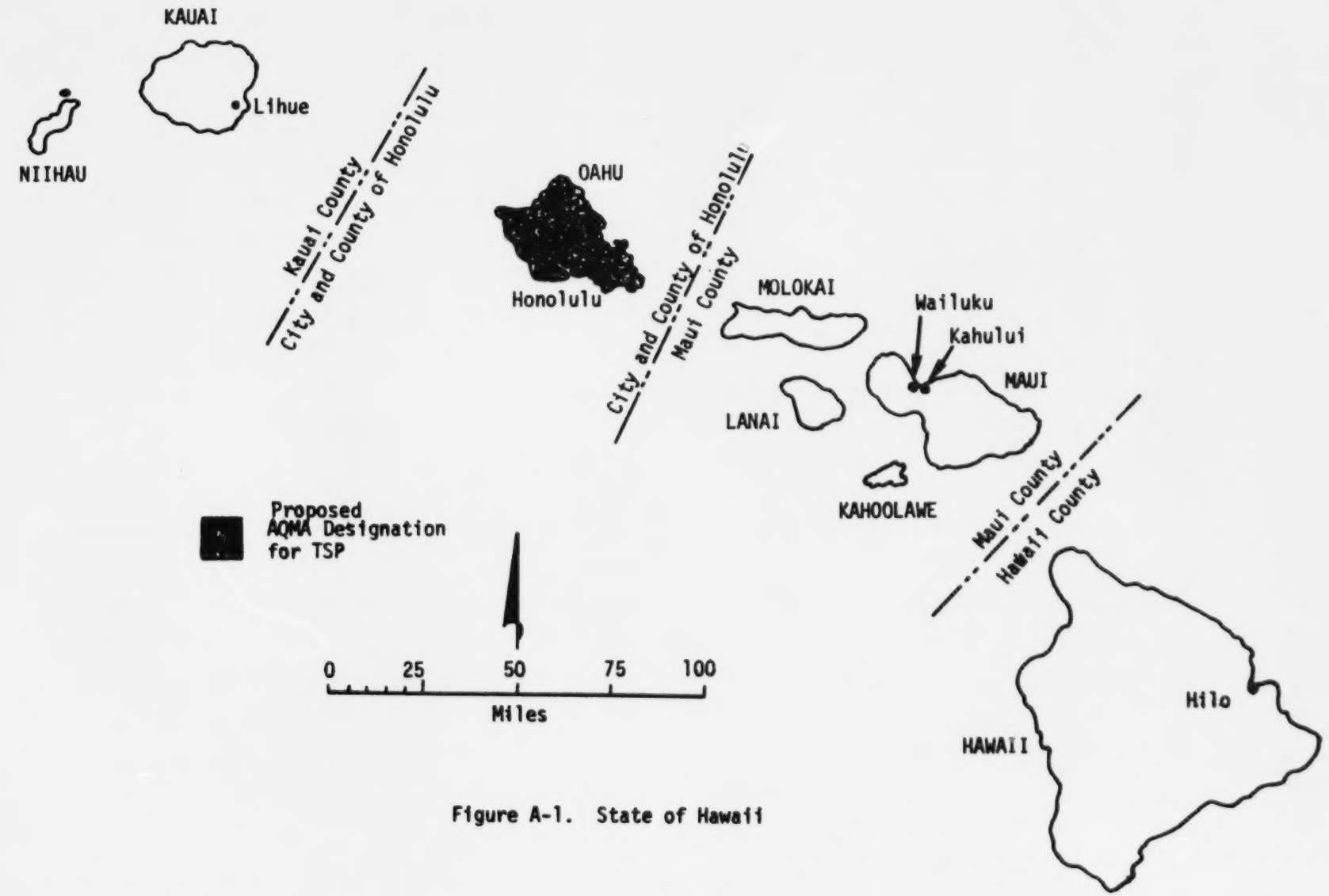

Figure A-1. State of Hawaii

Table A-2. State of Hawaii Population and Area Data

AQCR	County	Area (Square Miles)	1970 Population	Population Density (per Square Miles)
Hawaii	Honolulu	596	630,528	1058/0
	Hawaii	4,037	63,468	15.7
	Kauai	619	29,761	48.1
	Maui	1,173	46,156	39.4

Table A-3. Attainment Dates

AQCR	Name	Particulate Attainment Dates		Sulfur Oxides Attainment Dates		Nitrogen Oxides Attainment Dates
		Primary	Secondary	Primary	Secondary	
060	Hawaii	7/75	7/75	a	a	a

[a]Air quality levels presently below standards.

Table A-4. Hawaii Ambient Air Quality Standards

All Concentrations in $\mu g/m^3$

		Total Suspended Particulates		Sulfur Oxides			Nitrogen Dioxide
		Annual	24-Hour	Annual	24-Hour	3-Hour	Annual
Federal	Primary	75 (G)	260[a]	80 (A)	365[a]	-	100 (A)
	Secondary	60 (G)	150[a]	-	-	1300[a]	100 (A)
State		55 (A)	100	20 (A)	80	400	70 (A)

[a]Not to be exceeded more than once a year.

(A) Arithemetic mean.

(G) Geometric mean.

Table A-5. Hawaii AQCR Air Quality Status, TSP[a]

AQCR	# of Stations Reporting	TSP Concentration ($\mu g/m^3$) Highest Reading Annual	Highest Reading 24-Hr	2nd Highest Reading 24-Hr	Number of Stations Exceeding Federal Ambient Air Quality Standards Primary Annual	Primary 24-Hr[b]	Secondary Annual	Secondary %	Secondary 24-Hr[b]	Secondary %	% Reduction Required to Meet Standards[c]
Hawaii	16	80	329	326	1	1	2	13	2	13	54

[a]1973 air quality data in National Air Data Bank - June 7, 1974.

[b]Violations based on more than one excess of the standard.

[c]Calculated from: $\frac{\text{2nd Highest 24 Hr Reading - 24 Hr Standard}}{\text{2nd Highest 24 Hr Reading}}$

Note: No background for 24 hr averages were given in the SIP; the average was thus assumed to be zero.

Table A-6. Hawaii AQCR Air Quality Status, SO_2[a]

AQCR	# of Stations Reporting 24-Hr	# of Stations Reporting Continuous	SO_2 Concentration ($\mu g/m^3$) Highest Reading Annual	Highest Reading 24-Hr	2nd Highest Reading 24-Hr	Number of Stations Exceeding Federal Ambient Air Quality Standards Primary Annual	Primary 24-Hr[b]	Secondary 3-Hr	% Reduction Required to Meet Standards[c]
Hawaii	12	0	6	51	38	0	0	N/A	c

[a]1973 air quality data in National Air Data Bank - June 7, 1974.

[b]Violations based on more than one excess of the standard.

[c]Reduction was not calculated because both the 2nd highest 24 hour reading and the annual reading are less than 1/2 of the corresponding standards. It was decided that to calculate reductions in this case would yield misleading results.

N/A = not available.

Table A-7. Hawaii Fuel Combustion Source Summary

AQCR	Power Plants	Other Fuel Combustion Point Sources	Total Fuel Combustion Emissions (10^3 tons/year)	
			Particulate	SO_2
Hawaii	8	104	11.5	42.5

Table A-8. Hawaii Emission Summary, Particulates[a]

AQCR	Total (10^3 Tons/Year)	Electrical Generation 10^3 Tons/Year	%	Industrial, Institutional Commercial Point Source Fuel Combustion 10^3 Tons/Year	%	Area Source Fuel Combustion 10^3 Tons/Year	%	Other Sources of Particulate Emissions 10^3 Tons/Year	%
Hawaii	67.9	1.1	1.6	10.0	14.7	0.4	0.6	56.4	83.1

[a] 1972 emissions in data bank as of June 27, 1974

bDoes not include fugitive dust

Table A-9. Hawaii Emission Summary, SO_2[a]

AQCR	Total (10^3 Tons/Year)	Electrical Generation 10^3 Tons/Year	%	Industrial, Institutional Commercial Point Source Fuel Combustion 10^3 Tons/Year	%	Area Source Fuel Combustion 10^3 Tons/Year	%	Other Sources of SO_2 Emissions 10^3 Tons/Year	%
Hawaii	50.7	26.8	52.9	14.3	28.3	1.4	2.8	8.2	16.1

[a]1972 emissions in data bank as of June 27, 1974

Table A-J0a Hawaii Required Emission Reductions, Particulates

AQCR	SIP: AQ Measurement Control Value	SIP: Emissions (10^3 tons)	SIP: Allowable Emissions (10^3 tons)	SIP: 1975 Estimated Emissions After Controls (10^3 tons)	Percent Reduction Required Based On 1973 AQ Data[b]	NEDS Emissions[c] (10^3 tons)	Allowable Emissions (10^3 tons)	Emission Tolerance (10^3 tons)
Hawaii	74 $\mu g/m^3$[a]	51	34.2	26.8	54	67.9	31.2	0[d]

[a]Annual geometric mean.

[b]From Table A-5.

[c]From Table A-8.

[d]Although the SIP calculated emission tolerance and the emission tolerance calculated based on 1973 data agree substantially (less than 10% difference), it was decided that because the 1973 emissions were greater than the 1970 emissions, the standards would be met in 1975 with little or no tolerance.

Table A-10b. Hawaii Required Emission Reductions, SO_2

AQCR	SIP: AQ Measurement Control Value	SIP: Emissions (10^3 tons)	SIP: Allowable Emissions (10^3 tons)	SIP: 1975 Estimated Emissions After Controls (10^3 tons)	Percent Reduction Required Based On 1973 AQ Data	NEDS Emissions (10^3 tons)	Allowable Emissions (10^3 tons)	Emission Tolerance (10^3 tons)
Hawaii	a	58.0	b	N/A	b	50.7	b	b

[a]Air quality was below the standards when the SIP was written.

[b]Reductions were not calculated because the 2nd highest 24-hour reading and the annual reading are both less than 1/2 of the corresponding standard. It was decided that to calculate reductions in this case would yield misleading results.

N/A = not available.

Table A-11. Hawaii Fuel Combustion Emission Regulations

Particulates	- maximum of 0.4 lbs/100 lbs of bagasse as burned (effective September 24, 1971 for new sources and December 31, 1973 for existing sources).
SO_2	- maximum of 2.0% sulfur by weight content in fuel oil. - maximum of 0.5% sulfur by weight content in fuel oil burned in fossil fuel fired power and steam generating facilities having a power generating output in excess of 25 megawatts or a heat input of greater than 250 million Btu/hr (effective on June 1, 1974).

APPENDIX B - REGIONAL AIR QUALITY ANALYSIS

Tables B-1 and B-2 are the assessment of AQCR's which should be examined for the fuel switching impact on particulate and SO_2 emissions. They also provide an identification of those AQCR's which show little potential for fuel revision or regulation relaxation if ambient air standards are to be attained.

The criteria for candidates are:(1) the severity and breadth of air quality violations, (2) the tolerance for emissions increased in the AQCR, (3) the fraction of total emissions resulting from fuel combustion, and (4) AQMA designations. It should be noted that an AQCR may not necessarily need relaxation of regulations in order to accomplish fuel switching. Further, a good candidate in Tables B-1 and B-2 may later show little potential for fuel switching after individual sources are examined. Finally, it is possible that an AQCR may have air quality levels below standard at present and may require more <u>strict</u> regulations than currently exist if all fuel burning sources were converted to dirtier fuels, i.e., "average" emission rate now may be below "average" regulations.

Table B-1. Hawaii Candidacy Assessment for Revision of Particulate Regulations

AQCR	Air Quality Summary # of Stations	# of Stations with Violations of National Secondary Standards Annual	24-Hr	Expected Attainment Date	Counties with Proposed AQMA Designation for Particulates?	Total Emissions (Tons/Year)	% Emission from Fuel Combustion	Tolerance for Emission Increase in 1975[a] (Tons/Year)	Region Wide Evaluation
Hawaii	16	2	2	7/75	Yes	67,900	16.9	0	Poor Candidate

[a]From Table A-10$_a$

Table B-2. Hawaii Candidacy Assessment for Revision of SO_2 Regulations

Air Quality Summary										
AQCR	# of Stations	# of Stations with Violations of National Secondary Standards		Expected Attainment Date	Counties with Proposed AQMA Designation for SO_2 ?	Total Emissions (Tons/Year)	% Emission from Fuel Combustion	Tolerance for Emission Increase in 1975[a] (Tons/Year)	Region Wide Evaluation
		Annual	24-Hr						
Hawaii	12	0	0	a	No	50,700	83.9	b	Marginal Candidate

[a]Present air quality is below standards.

[b]Not calculated, see Footnote b in Table A-10[b]

APPENDIX C - POWER PLANT ASSESSMENT

This section is a review of individual power plants by AQCR. The intent is to illustrate fuel switching possibilities and particulate and SO_2 emissions resulting from these switches on an individual plant basis.

Current power plant information used to prepare Table C-1 were obtained from three main sources: (1) Federal Power Commission computerized listings of power plants and their associated fuel use, (2) the National Coal Association "Steam Tables" listing of power plants and fuel use in 1972, and (3) NEDS Emissions data.[1] For those plants listed by the FPC (1 above), the 1973 fuel schedule was assumed, otherwise, fuel use is for 1972. Heat inputs are those based on actual fuel values where known, and average values shown in Table C-2 were used where not known. SO_2 and particulates emissions are those associated with the fuel use shown. In the case of particulates, emissions were calculated using NEDS emissions factors applied to the listed fuel schedule (in both tonnage and $lbs/10^6$ Btu). When a plant was not listed in NEDS, AP 42 emission factors were used to estimate SO_2 and particulate emissions (see Table C-2).

For the purposes here, it is assumed that when a plant is shown to have dual fuel capability, it is able to use entirely one fuel or the other. A fuel switch calculation is then made, assuming all natural gas use is replaced by either oil or coal depending on assumed plant capabilities. Further, oil use is replaced by coal where possible. The % sulfur in fuel (coal or oil) assumed when fuels are switched is indicated in Table C-1. A plant was then assumed to have the same emission controls as was in effect when the NEDS emissions were assembled. The resulting emissions which would then accompany such fuel switches are tabulated in both tonnage and $lbs/10^6$ Btu.

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[1] NEDS Data Bank 1974

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Also shown is the 1975 regulations which are currently applicable to the given plant, taken from Table A-11. (Particulate limits are assumed to be based on the entire heat input of the plant. Actual rules may be different when applied to each of several boilers in a power plant or applied on the basis of design capacity rather than actual amount of fuel used.)

The fuel switch calculations are intended to show the magnitude of emissions increase accompanying a fuel switch without additional controls. The exact emissions would depend upon actual fuel mix, amount of sulfur in fuels, and degree of emissions controls (particulates).

It might be cautioned that AQCR total emissions calculated in the tables of Appendix C (and also Appendix D) may not agree exactly with total emissions represented in Appendix A (Tables A-8, A-9). This is a result of both differing fuel schedules in 1973 compared to previous years and the relative "completeness" of the NEDS data bank.

Table C-1. Hawaii Power Plant Analysis[a]

AQCR	Power Plant	Capacity (Mw)	Type[b] % S	Annual Quantity[b] (10^3 Gallons)	Emissions[b] (Tons/Year) SO_2	1975 Regulations % S Required[e]	Resulting Emissions if 1975 Regulation Sulfur Content Fuel is Used[c] (Tons/Year)	Emission Changes[d] (Tons/Yr)
Hawaii	Port Allen	10	Oil 1.83%	5,562	650	2	710	+ 60
	Maui Electric	34	Oil 1.3%	14,128	1,480	2	2,277	+797
	Honolulu	168	Oil 0.36%	34,598	989	0.5	1,374	+385
	Kahe	340	Oil 1.31%	81,190	8,560	0.5	3,267	-5293
	Waiau	395	Oil 0.5%	65,830	4,857	0.5	4,857	0
			Oil 1.29%	2,400	98	0.5	39	-59
	Waiaku	103	Oil 1.51%	11,740	1,410	2	1,866	+456
	Kanoelehua	8	Oil 1.51%	7,450	894	2	1,184	+290
	Kanoelekua	10	N/A	N/A	N/A	N/A	N/A	N/A
	Hilo Electric	37	N/A	N/A	N/A	N/A	N/A	N/A

[a]Does not include gas turbine and diesel units.

[b]From NEDS (file date: September 7, 1973).

[c]Calculated from: $\left(\frac{\text{1975 Required Sulfur \%}}{\text{Current Sulfur \%}}\right)$ x NEDS Emissions .

[d]Calculated from: Resulting Emissions - NEDS Emissions.

[e]At plants with more than one size of boilers (in terms of heat input/hour), the % sulfur required was selected on the basis of the largest boiler.

N/A = Not available.

Table C-2 AP-42 Power Generation Emission Factors

Fuel	Particulates Lbs/Ton	Particulates Lbs/10^6 Btu	SO_2 Lbs/Ton	SO_2 Lbs/10^6 Btu	Hydrocarbons Lbs/Ton	Hydrocarbons Lbs/10^6 Btu	NO_x (as NO_2) Lbs/Ton	NO_x (as NO_2) Lbs/10^6 Btu
Coal[1] (Bit.)								
General	160	7.4			0.3	0.013	18	0.78
Wetbottom 10% A	130	7.0					30	1.3
Cyclone	20	0.9					55	2.4
1% S	Same	Same	38	1.65	0.3	0.13	Same	Same
2% S	as	as	76	3.3			as	as
3% S	Above	Above	114	5.0			Above	Above
Oil[2]	Lb/10^3 Gal		Lb/10^3 Gal		Lb/10^3 Gal		Lb/10^3 Gal	
0.5% S	8	0.058	79	0.56	2	.014	105	0.75
1.0% S	8	.058	157	1.12	2	.014	105	0.75
2.0% S	8	.058	314	2.24	2	.014	105	0.75
Gas[3]	Lb/10^6Ft^3		Lb/10^6Ft^3		Lb/10^6Ft^3		Lb/10^6Ft^3	
(.3 lbs S/ 10^6 Ft^3)	15	.015	0.57	.00057	1	.001	600	0.60

(1) Coal 23 x 10^6 Btu/Ton

(2) Oil 140 x 10^3 Btu/Gal

(3) Gas 1000 Btu/Ft^3

APPENDIX D - INDUSTRIAL, COMMERCIAL, INSTITUTIONAL SOURCE ASSESSMENT

Table D-1 in this appendix lists individual industrial/commercial/institutional sources of particulates and SO_2 emissions which might show fuel switching potential. The sources are from a NEDS rank order emissions listing. A fuel switch emissions calculation is then made similar to that performed for power plants.

Table D-1. Hawaii Industrial/Commercial/Institutional Point Source Fuel Combustion Evaluation

AQCR	Plant	% S in Oil Used[a]	Quantity of Oil Used[a] (10^3 Gallons)	SO_2 Emissions[a] (Tons/Year)	1975 % S Regulation	Resulting Emissions with 1975 % S Regulations[b] (Tons/Year)	Change in Emission due to % S Regulation (Tons/Year)
Hawaii	Standard Oil	3.8	10416	3110	2	1640	-1470
	Kaiser Cement	1.66	9600	1250	2	1506	+ 256
	Hawaiian Cement	1.7	4860	649	2	764	+ 115
	Puna Sugar	1.8	2433	344	2	382	+ 38
	Dole Company	1.4	2300	253	2	361	+ 108
	H.C. and S Sugar	1.75	1706	234	2	267	+ 33
	Oahu Sugar	1	2482	195	0.5	98	- 98
	Haw. Western Steel	1.4	1644	181	2	259	+ 78
	Tripler Hospital	2.7	840	178	2	132	- 46
	C & H Sugar	1.4	00	143	0.5	51	- 92
	Waialua Sugar	1.6	814	102	0.5	32	- 70
	Pioneer Sugar Mill	1.6	772	97	2	121	+ 24
	Del Monte Corp.	1.17	487	88	2	150	+ 62
	Pacific Laundry	1.4	700	77	2	110	+ 33
	Hawaiian Agriculture	1.1	806	70	2	127	+ 57
	Hawaiian Linen Supply	1.6	546	69	2	86	+ 17
	Maui Land and Pineapple	1.25	637	62	2	99	+ 37
	Gaspro	1.4	437	48	2	69	+ 21
	Grove Farm Sugar	1.1	549	47	2	85	+ 38
	Kekaha Sugar	1.1	505	44	0.5	20	- 24
	Kohala Sugar	1.97	272	42	2	43	+ 1
	Young Laundry	1.4	378	42	2	60	+ 18
	Laupahoehoe	1.3	398	41	0.5	16	- 25
	Haw. Comm. and Sugar	1.75	284	39	2	45	+ 6
	Hawaiian Tuna Packers	1.6	261	33	2	41	+ 8
	Lihue Plantation	0.7	560	31	2	89	+ 58
	Wailuku Sugar	1.4	275	30	2	43	+ 13

Table D-1. Hawaii Industrial/Commercial/Institutional Point Source Fuel Combustion Evaluation (Cont'd)

AQCR	Plant	% S in Oil Used[a]	Quantity of Oil Used[a] (10^3 Gallons)	SO_2 Emissions[a] (Tons/Year)	1975 % S Regulation	Resulting Emissions with 1975 % S Regulations[b] (Tons/Year)	Change in Emission due to % S Regulation (Tons/Year)
Hawaii	American Sanitary Laundry	1.6	231	29	2	36	+ 7
	Queens Med. Center	1.4	246	27	2	39	+12
	Schofield Barracks	2.7	119	25	2	19	- 6
	Honokaa Sugar	2.03	119	19	0.5	5	-14
	Grove Farm Sugar	1.1	206	18	2	33	+15
	Maui Snow White Laundry	1.4	160	18	2	26	+ 8
	Hilo Coast Proc. Co.	1.1	779	67	2	122	+55
	Honolulu Laundry	1.4	154	17	2	24	+ 7
	Nanakuli Paving	1.06	198	16	2	30	+14
	McBryde Sugar	1.3	159	16	0.5	6	-10
	Leuhi Sugar	1.4	138	15	2	21	+ 6
	Prestressed Concrete	1.6	122	15	2	19	+ 4
	Spuds Laundry	1.4	126	14	2	20	+ 6
	Dillingham Prestressed	1.4	127	14	2	20	+ 6
	Kuakiui Hospital	1.4	120	13	2	19	+ 6
	St. Francis Hospital	1.4	118	13	2	19	+ 6
	Foremost Dairies	1.4	100	11	2	16	+ 6
	Meadow Glow Dairies	1.62	83	11	2	14	+ 3
	Royal Hawaiian Hotels	1.4	96	11	2	16	+ 5
	Dole Co.	1.4	100	11	2	16	+ 5
	Maui Memorial Hospital	1.4	100	11	2	16	+ 5
	Weyerhaeuser Corp.	1.4	84	9	2	13	+ 4
	Total						-649

a From NEDS (file date September 7, 1973)

b Calculated from : $\left[\frac{\text{1975 \% S Required}}{\text{Current \% S}}\right]$ X Emissions

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